

What Is Claimed Is:

1. A gas injection valve for use in injecting gas samples at controlled pressure into a gas chromatograph, the gas injection valve comprising a gas sample inlet port, a carrier gas inlet port, a gas sample loop, a waste port, a pressure control port, an outlet port, passaging extending between the gas sample inlet port, the carrier gas inlet port, the gas sample loop, the waste port, the pressure control port and the outlet port, and microvalves at least partially disposed in said passaging for selectively blocking the flow of gas between the gas sample inlet port, the carrier gas inlet port, the gas sample loop, the waste port, the pressure control port and the outlet port except through the microvalves, the microvalves being operable to a first state in which the gas sample inlet port is in fluid communication with the sample loop and the waste port, and the carrier gas inlet port is in fluid communication with the outlet port, a second state in which the gas sample loop is blocked from the gas sample inlet port and in fluid communication with the pressure control port for controlling the pressure of the gas in the gas sample loop, the gas sample inlet port is in fluid communication with the waste port, and the carrier gas inlet port remains in fluid communication with the outlet port, and a third state in which the carrier gas inlet port is in fluid communication with the gas sample loop and the gas sample loop is in fluid communication with the outlet port for injecting the gas in the gas sample loop out of the valve through the outlet port.

2. An array of gas injection valves as set forth in claim 1 for parallel injection of gas samples into a multi-channel gas chromatograph.

3. A parallel injection valve for simultaneously injecting each of four or more gas samples into a mobile

5 phase for fluid communication with one of four or more gas
chromatography columns of a gas chromatograph, the parallel
injection valve comprising four or more microvalve
assemblies, each of the four or more microvalve assemblies
being adapted to receive one of the four or more samples
into a sample loop at a first pressure, to change the
pressure of the sample to a second pressure while the sample
10 resides in the sample loop, and to discharge the changed-
pressure sample into the mobile phase.

4. A method of injecting discrete gas samples at a
controlled pressure to a gas chromatograph for analysis, the
method comprising:

receiving sample gas to be analyzed into an injection
valve;

feeding the received sample gas through a sample loop;
isolating the sample loop from receiving further sample
gas;

controlling the pressure of the gas in the sample loop;
and

injecting the controlled pressure sample gas in the
sample loop into the gas chromatograph.

5. A combinatorial chemistry reaction and evaluation
system comprising:

a reactor including multiple reaction chambers adapted
for receiving one or more inputs and creating reaction
product gas samples at different pressures;

an array of injection valves connected to the reactor
for receiving the gas samples at different pressures, the
injection valves each being adapted to segregate a discrete
sample of gas, control the pressure of the sample and emit
the discrete gas sample;

a gas chromatograph having multiple sample columns and
a detection system comprising four or more flow detectors,
the gas chromatograph being connected to the injection valve
array for receiving parallel discrete samples from the

injection valve array and analyzing the composition of the samples in parallel.

6. A gas chromatograph having four or more analysis channels for simultaneous analysis of four or more fluid samples, the gas chromatograph comprising

four or more gas chromatography columns, each of the four or more gas chromatography columns comprising an inlet for fluid communication with a gaseous mobile-phase, a separation media effective for separating at least one component of the sample from other components thereof, and an outlet for discharging the separated sample,

a parallel injection valve for simultaneously injecting each of the four or more samples into a mobile phase for fluid communication with one of the four or more gas chromatography columns, the parallel injection valve comprising four or more microvalve assemblies, each of the four or more microvalve assemblies being adapted to receive one of the four or more samples into a sample loop at a first pressure, to change the pressure of the sample to a second pressure while the sample resides in the sample loop, and to discharge the changed-pressure sample into the mobile phase, and

a detection system comprising four or more flow detectors, each of the flow detectors having an inlet port in fluid communication with the outlet one or more of the gas chromatography columns for receiving a separated sample, a detection cavity for detecting at least one component of the separated sample, and an outlet port for discharging the sample.